

REMARKS

Please reconsider the application in view of the above amendments and the following remarks. Applicant thanks the Examiner for indicating that claims 4 – 10 and 14 – 16 contain allowable subject matter and for carefully considering this application.

Disposition of Claims

Claims 1 – 19 are currently pending in this application. New claims 20 – 21 have been added. Claims 1, 11, 20, 21, are independent. Claims 2 – 10 depend, directly or indirectly, from independent claim 1. Claims 12 – 19 depend, directly or indirectly, from independent claim 11.

New Claims

By way of this reply, claims 20 – 21 have been added. Applicant respectfully asserts that no new matter is added by way of new claims 20 – 21, as support for new claims 20 – 21 may be found, for example, in the originally filed claims, figures and the specification.

Apparatus claim 20

Specifically, claim 20 recites, in part, “a laser source for producing a laser beam having a given intensity...” and “a first beam splitter for dividing the laser beam into a reference beam and an object beam to be directed to the object, thereby producing a scattered object beam being modulated according to the displacement of the object....” Support for this amendment may

be found, for example, in Figures 1 – 4C, elements 10, 12, 19, 21, and 100, and paragraphs [0054] – [0062] of the originally-filed specification.

Claim 20 also recites, in part, “a processing circuit comprising a differential amplifier for subtracting at least two electrical interference signals formed by at least two portions of the interference beam, thereby generating a displacement signal, the displacement signal comprising substantially the wanted signal component alone, wherein the intensity noise is substantially rejected... .” Support for this amendment may be found, for example, in Figure 2A, 2B, 4A, and 4B, elements 84, 60a, 60b, 122, 24, 25, 120, and 121, and paragraphs [0058], [0060], and [0063] – [0064] of the originally-filed specification.

Claim 20 also recites, in part, “a beam combiner for combining the scattered object beam and the reference beam, thereby providing at least one interference beam... .” Support for this amendment may be found, for example, in Figure 1 – 4B, elements 19, 21, 23, 24, 25, 36, 49, 69, and 80, and paragraphs [0054], [0057] – [0059], and [0060] – [0061] of the originally-filed specification.

Additionally, claim 20 also recites, in part, “at least one array of detectors for receiving the at least one interference beam, each detector of the array receiving a portion of the at least one interference beam to form an electrical interference signal, the electrical interference signal comprising a wanted signal component indicative of the object displacement and a substantially equal intensity noise component....” Support for this amendment may be found, for example, in

Figures 2A – 4C, elements 39, 40, 56a, 56b, 57a, 57b, 71, 82, and 88, and paragraphs [0057] – [0061] of the originally-filed specification.

Method claim 21

Specifically, claim 21 recites, in part, “generating a laser beam having a given intensity...,” and “dividing the laser beam into a reference beam and an object beam to be directed to the object, thereby producing a scattered object beam being modulated according to the displacement of the object....” Support for this amendment may be found, for example, in Figures 1 – 4C, elements 10, 12, 19, 21, and 100, and paragraphs [0054] – [0062] of the originally-filed specification.

Additionally, claims 21 recites, in part, “processing at least two electrical interference signals formed by at least two portions of the interference beam, the processing comprising subtracting the at least two electrical interference signals, thereby generating an output signal, the output signal comprising substantially the wanted signal component alone, wherein the intensity noise is substantially rejected...” Claim 23 recites, in part, a substantially similar processing step. Support for this amendment may be found, for example, in Figure 2A, 2B, 4A, and 4B, elements 84, 60a, 60b, 122, 24, 25, 120, and 121, and paragraphs [0058], [0060], and [0063] – [0064] of the originally-filed specification.

Claim 21 also recites, in part, “combining the scattered object beam and the reference beam to provide at least one interference beam...” Support for this amendment may be found, for example, in Figure 4C and paragraph [0062] of the originally-filed specification.

Additionally, claim 21 also recites, in part, “receiving the at least one interference beam with at least one array of detectors, each detector array receiving a portion of the at least one interference beam to form an electrical interference signal, the electrical interference signal comprising a wanted signal component indicative of the object displacement and an intensity noise component... .” Support for this amendment may be found, for example, in Figures 3, 4A, and 4C and the corresponding paragraphs of the originally-filed specification.

Rejection(s) under 35 U.S.C. § 102

Claims 1 – 3 and 11 – 13 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 7,006,231 (“Ostrovsky”). To the extent that this rejection applies to the amended claims, this rejection is respectfully traversed.

In order to establish anticipation under 35 U.S.C. § 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present. See MPEP § 2131.

The present application general relates to a laser interferometric method and apparatus for measuring transient motion from a surface. One embodiment of the present invention relates to a multi-channel laser interferometer for measuring the displacement of a surface of a material subjected to ultra-sound.

Accordingly, claim 1 recites, in part, a multi-channel laser interferometric method which comprises “generating a laser beam...passing [a] probe beam through an optical lens to

focalize the probe beam onto the surface of the material subjected to ultrasound, thereby scattering the same.” In addition claim 1 recites, with respect to signal processing, “processing for each channel said electrical signals...[and] summing electrically said processed signals to extract an output signal correlated to the motion of said surface.” Claim 11 is a corresponding apparatus claim and recites substantially similar limitations. Applicant respectfully submits that Ostrovsky is silent with respect to at least the above limitations recited in claims 1 and 11.

Ostrovsky discloses a fiber optic interferometric system for use in optical coherence tomography. Accordingly, Ostrovsky merely discloses an interferometer for generating “an interference pattern corresponding to the variation in the sample reflection with depth of the sample along the sample beam.” (*See*, Ostrovsky, col. 1, ll. 32-35). Ostrovsky is completely silent with respect to an apparatus for measuring the motion of a surface of a material subjected to ultrasound as required by claims 1 and 11.

The Examiner alleges that Ostrovsky discloses a laser source, as required by the claims 1 and 11. However, Ostrovsky discloses that the source 102 shown in Figures 6 and 11 is “a low coherence light source” in order to properly image the sample depth information in an optical coherence tomography system. (*See*, Ostrovsky col. 3, l. 47). As is commonly known in the art, a laser beam is *not* a low coherence light source but, rather, a source with a high degree of both spatial and temporal coherence. Further, the Examiner alleges that Ostrovsky discloses that material 119 is subjected to ultrasound as required by claims 1 and 11. However, Ostrovsky is silent with respect to the use of ultrasound and merely discloses that “sample of interest 119...may be tissue within the body cavity.” (*See*, Ostrovsky, col. 7, l. 28). Further, the Examiner alleges that Ostrovsky discloses

summing electrically the processed signals to extract an output signal correlated to the motion of the surface, as required by claims 1 and 11. However, Ostrovsky merely discloses signal processing for extracting *depth information* from the *stationary* sample. (*See*, Ostrovsky, col. 8, ll. 25-49). (emphasis added). Furthermore, according to Ostrovsky “the depth information is provided by the spatial position within the interference pattern.” (*See*, Ostrovsky, col. 8, ll. 33-35). Thus, Ostrovsky requires that independent detector channels must *not* be summed in order to preserve the spatial position information within the interference pattern.

In view of the above, Ostrovsky does not disclose every limitation recited in either claim 1 or claim 11. Thus, claims 1 and 11 are patentable over Ostrovsky. Claims 2-3 and 12-13 depend from claims 1 and 11, respectively, and are allowable for at least the same reasons as claims 1 and 11. Accordingly, Applicant respectfully requests withdrawal of this rejection.

New Claims

New claim 21 recites a method for measuring the displacement of an object comprising, in part, the steps of “generating a laser beam having a given intensity...producing a scattered object beam being modulated according to the displacement of the object...[and] a processing circuit comprising a differential amplifier for subtracting at least two electrical interference signals formed by at least two portions of the interference beam, thereby generating a displacement signal, the displacement signal comprising substantially the wanted signal component alone, wherein the intensity noise is substantially rejected.” Claim 20 is an apparatus claim corresponding to claim 21 and, thus, recites substantially similar limitations to claim 21.

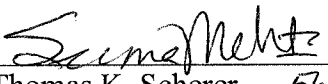
In view of the above arguments in regard to claims 1 and 11, Ostrovsky is silent with respect to at least “generating a laser beam having a given intensity” and “producing a scattered object beam being modulated according to the displacement of the object,” as required by claims 20 and 21. Rather, Ostrovsky merely discloses the use of a low coherence light source and a static object. (*See*, Ostrovsky, col. 7, l. 28 and (*See*, Ostrovsky col. 3, l. 47). Furthermore, Ostrovsky is silent with respect to at least a processing circuit comprising a differential amplifier for subtracting at least two electrical interference signals to generate a displacement signal, as required by claims 20 and 21. Thus, new claims 20 and 21 are patentable over Ostrovsky. Favorable consideration of claims 20 and 21 is respectfully requested.

Conclusion

Applicant believes this reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 17174/002001).

Dated:

Respectfully submitted,

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